CLAIMS

We claim:

1. A transporter peptide comprising at least one amino acid sequence selected from the group consisting of:

   a) $(X_mRX_oRX_n)$;

   b) (X_mRRRX_n);

   c) (X_mRRXRX_n); and

   d) (X_mRXRRX_n),

   wherein

   X is a non-basic amino acid;

   m is an integer from zero to fourteen;

   n is an integer, independent of m, between zero and fourteen;

   o is an integer, independent of m and n. between zero and five; and

   wherein said transporter peptide is capable of translocating across a biological membrane.

2. The transporter peptide of claim 1, wherein the amino acid sequence is R-X-X-R.

3. The transporter peptide of claim 1, wherein the transporter peptide is coupled to an effector.

4. The transporter peptide of claim 3, wherein said effector is a nucleic acid.

5. The transporter peptide of claim 3, wherein said nucleic acid is DNA.

6. The transporter peptide of claim 3, wherein said nucleic acid is RNA.

7. The transporter peptide of claim 3, wherein said effector is a peptide.

8. The transporter peptide of claim 3, wherein said effector is a pharmaceutically active agent.

9. The transporter peptide of claim 8, whercin said pharmaceutically active agent is selected from the group consisting of: a toxin; an antibiotic; an antipathogenic agent; an antigen; an antibody fragment; an immunomodulator; an enzyme, and a therapeutic agent.

10. The transporter peptide of claim 1, wherein the peptide is less than 50 amino acids long.

11. The transporter peptide of claim 1, wherein the peptide is less than 25 amino acids long.

12. The transporter peptide of claim 1, wherein the peptide is less than 15 amino acids long.

13. The transporter peptide of claim 1 wherein translocation occurs within a tissue selected from the group consisting of: pancreatic B-cells; hepatocytes; colon cells; muscle cells; and lung cells.

14. A method of translocating the transporter peptide of claim 1 across the membrane of pancreatic B-cells, wherein the transporter peptide is selected from the group consisting of SEQ ID NOS: 1-6.

15. A method of translocating the transporter peptide of claim 1 across the membrane of hepatocytes, wherein the transporter peptide is selected from the group consisting of SEQ ID NOS: 7-10.

16. A method of translocating the transporter peptide of claim 1 across the membrane of colon cells, wherein the transporter peptide is SEQ ID NO: 11.

17. A method of translocating the transporter peptide of claim 1 across the membrane of muscle cells, wherein the transporter peptide is selected from the group consisting of SEQ ID NOS: 12-20.

18. A method of translocating the transporter peptide of claim 1 across the membrane of lung cells, wherein the transporter peptide is selected from the group consisting of SEQ ID NOS: 21-34.

19. A transporter unit comprising the transporter peptide of claim 1 conjugated to an effector.

20. The transporter unit of claim 19, wherein the effector is selected from the group consisting of: a nucleic acid; a peptide; and a pharmaceutically active agent.

21. A pharmaceutical composition comprising a therapeutically or prophylactically effective amount of the transporter unit according to claim 19, and a pharmaceutically acceptable carrier.

22. A method of producing a translocatable conjugate between the transporter peptide of claim 1 and an effector, said method comprising conjugating said effector to said transporter peptide to form a transporter peptide-effector conjugate.

23. A method of translocating an effector into the cytoplasm and nucleus of a eukaryotic cell, said method comprising:

a) conjugating said effector to the transporter peptide of claim 1 to form a transporter peptide-effector conjugate; and

b) introducing said transporter peptide-effector conjugate to the cell.

24. The method of claim 23, wherein the introducing step is achieved by incubating a cell culture in the presence of said transporter peptide-effector conjugate, or injecting said transporter peptide-effector conjugate into the cell of claim 22.

25. The method of claim 23, wherein the eukaryotic cell is a human cell.

26. A method of increasing the intracellular concentration of an effector within a eukaryotic cell, said method comprising;

a) conjugating said effector to the transporter peptide of claim 1 to form a transporter peptide-effector conjugate;

b) incubating said cell in the presence of said transporter peptide-effector conjugate, under conditions promoting active metabolism of said eukaryotic cell.

27. The method of claim 26, wherein the eukaryotic cell is a human cell.

28. A kit comprising in one or more containers, a therapeutically or prophylactically effective amount of the pharmaceutical composition of claim 21.

29. A method of treating or preventing a disease, said method comprising administering to a subject in which such treatment or prevention is desired the pharmaceutical composition of claim 21, in an amount sufficient to treat or prevent said disease in said subject.

30. The method of claim 29, wherein said disease is selected from a group consisting of: diabetes; colon cancer; respiratory ailments; neurodegenerative disorders; cardiplegia; and viral infections.

31. A method of screening a phage library for transporter peptides, said method comprising:
    a) providing a phage display library;
    b) screening said library against specific cell types; and
    c) determining the cells having internalized phages.

32. The method of claim 31 further comprising the steps of:
    d) identifying the DNA from internalized phages; and
    e) deducing the expressed peptides.

33. The method of claim 31, wherein said screening step includes panning for at least three cycles.

34. The method of claim 31, wherein said phage display library is a multivalent phage display library.

35. A transporter peptide, wherein the amino acid sequence is selected from the group consisting of SEQ ID NOS: 1-34.